

Upwell & Outwell, Norfolk

£13.88m vacuum sewerage system for two parishes

by
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Selection of a vacuum sewerage scheme rather than a gravity option secured timely delivery of an efficient first time sewerage system to two parishes south of Wisbech, in the Norfolk Fens. The agglomeration extends to a total of 1,510 properties and covers some 13,700 hectares, stretching 4.5kilometres. Flat low lying land with high water tables meant that trenches exceeding 3m depth would require extensive dewatering. Anglian Water's Value Management process indicated that a Vacuum Sewerage Scheme would have significant benefits over a gravity option by minimising the depth of excavation and, therefore, the level of local disruption and amount of material to be handled, while also reducing the risk to properties and third party apparatus. The number of pumping stations would also be reduced from 32 to 8.



Upwell & Outwell: One of the vacuum stations in the UK's largest vacuum sewerage system

courtesy Anglian Water Services

Anglian Water is obliged under the provisions of the Urban Waste Water Regulations 1994 to provide sewerage systems for agglomerations greater than 2,000 population. The combined Upwell and Outwell parishes (concerned with this scheme) have a population of 4,300 and, therefore, meet this requirement.

Under the regulations the sewerage system is to be complete and commissioned by the 31st December 2005.

The project

The project was split into four separate drainage areas, each served by a vacuum station. Three conventional submersible type pumping stations transfer flows across the two villages and also collect flows currently treated by four small housing estate type treatment works which will be abandoned. A terminal pumping station discharges all flows from the catchment into the existing sewers at Emneth for onward passage and treatment at Wisbech STW. The scheme also comprises 23km of vacuum sewers, 423 vacuum collection sumps and 10kms of disposal mains.

This Vacuum sewerage project will become one of the largest

undertaken in Europe and the largest in the UK.

The vacuum system was designed to cater for foul sewage flows only up to a peak flow rate of 6DWF based on 4,000litres per property per day. The sewage discharge pumps were sized at 9 DWF. All vacuum stations are constructed with basement designs to enable utilisation of the maximum 'lift' capability of the vacuum system. The vacuum pumps are rotary vane type, sized to pump the requisite air/liquid ratio for each system from atmosphere to vacuum in approximately 3 minutes.

Sewage from each property is collected by conventional gravity into valve chambers. Every valve chamber is connected to a vacuum sewer. There is no power source required for its operation and an interface valve opens and closes by sump liquid level and by the systems vacuum provided by vacuum pumps. Sewage from the vacuum main is transferred to the vacuum station and collected in a steel tank vacuum vessel before being pumped to the terminal pumping station.

Anglian Water Technology Group, with *Consultants Atkins,*



Vacuum station

courtesy: Anglian Water

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Contractor *Barhale Construction plc* and sub-contractors *Flow Vac Systems Ltd* and *Gilkes (Gilbert Gilkes & Gordon Ltd)* is undertaking the £13.88 million project on behalf of Anglian Water Services under its AMP3 Partnering Framework for Capital Schemes

Construction

Methods of work such ‘as directional drilling’ have been utilised in order to mitigate the impact of the works, minimise crop compensations and to overcome the constraints that might have occurred with open cut. Road and river crossings were also carried out by this method. The adoption of polyethylene manholes in private gardens facilitated reduced excavation/disposal and disturbance to the horticultural environment as they take up less space and do not require a full concrete surround as a normal PCC manhole would. Overall they were quicker to build, thus saving energy.

A design and method of construction developed by *Barhale* was used to construct the vacuum chambers, up to 3m deep, using a lorry mounted auger. These chambers are built by digging an initial conventional hole one metre deep, then a PCC pipe with a purpose made cutting ring is stood in the hole and an auger dropped inside the pipe. As the auger removes the ground the pipe sinks, caisson method. Apart from the reduced safety risk, no men in excavations, there is no excavation of working space, thus saving energy, materials and disturbance to surrounding ground and services. Nuisance to public is minimised and there is no waste concrete from over ordering for surrounds.

Many of the lateral pipes have been installed using a ‘Perforator’ again this is a ‘no dig technique, except in some cases for a small



Vacuum station

courtesy: Anglian Water

reception hole. Cost savings result from reduced excavation, disposal, reinstatement materials, lack of disturbance to surface and no need for traffic lights/management.

All of the eight pumping stations were constructed as caissons to reduce temporary works and construction safety risks. This meant no excavation and subsequent back fill of working space was necessary. Most of these were done 'wet' thus no dewatering except on completion when the water had settled and stilled. Environmental/pollution/nuisance risks were minimised as there were less lorry movements, reduced use of pumps and no need for heavy sheet piling, cranes or pile hammers.

Anglian Water has provided a high community liaison/PR involvement throughout the project to ensure local residents knew what opportunities the project provided and the timing of works affecting them. The PR work involved meeting with two

Parish Councils, holding 4 public presentations, 8 individual property owner surgeries, open days and regular liaison with schools, public transport coordinators and the highway authority.

Progress

Barhale commenced construction on 1st July 2002 and scheduled construction completion is June 2004, which is significantly in advance of the contract completion date of 31st March 2005.

The forecast project outturn cost is currently indicating an overall saving of £300,000. Projected revenue benefit to AWS for the property owner connectivity uptake for the provision of the foul sewerage service is currently 68% of properties in the agglomeration.■

Note: *The author of this article, Tom Trask, is Project Manager, Technology Group, Anglian Water Services.*



Installing the vacuum sewerage system

courtesy: Anglian Water